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# JOURNAL OF MOLECULAR CATALYSIS A: CHEMICAL

## *PatentsALERT*

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**Refinery catalysis / processes****5866496****Cracking catalyst and process for preparing same**

Albers Edwin; Burkhead Harry W; Shi Joseph C; Severna Park, MD, United States assigned to Thiele Kaolin

The invention is a catalyst and a process for manufacturing a catalyst. The process includes adding an effective amount of an acid-stable surfactant or an alkaline-stable surfactant to a slurry of particles including an active mineral component. Desirable active mineral components include natural or synthetic zeolites and specialty clays such as chlorite clays and other non-kaolin clays for use in catalysts.

**5866745****Catalytic / oxidative-promoted hydrocarbon pyrolysis**

Gartside Robert John; Shaban Atef; Summit, NJ, United States assigned to ABB Lummus Global

Light olefins are produced from a hydrocarbon feedstock by a steam pyrolysis reaction in the presence of small quantities of essentially pure oxygen and selected catalytic solids to enhance the steam pyrolysis reaction, to promote the combustion of hydrogen to water and to minimize the formation of carbon oxides. The catalysts are characterized by low surface area, by non-alumina supports and by the catalytic oxides of the group IVB, VB and VIB transition metals.

**5866746****Catalytic dehydroisomerization of C4–C5 *n*-paraffins**

Didillion Blaise; Travers Christine; Burzynski Jean-Pierre; Rueil Malmaison, France assigned to Institut Francais du Petrole

The present invention concerns, in the dehydroisomerization of at least one C4–C5 *n*-paraffin, preferably *n*-butane, the use of a catalyst comprising a refractory oxide-based support, preferably an alumina, at least one precious metal from group VIII, preferably platinum or palladium, optionally at least one element from group IVB such as titanium or zirconium, preferably titanium,

optionally at least one element from the group formed by germanium, tin, lead, rhenium, tungsten and indium, and optionally at least one halogen such as chlorine. The present invention also concerns the regeneration of this catalyst.

**5868921****Single-stage, stacked bed hydrotreating process utilizing a noble metal catalyst in the upstream bed**

Barre Guy; Van Den Berg Johannes Petrus; Grandvallet Pierre; Couronne, France assigned to Shell Oil

A hydrocarbon distillate fraction is hydrotreated in a single stage by passing the distillate fraction downwardly over a stacked bed of two hydrotreating catalysts. The catalyst in the upper bed contains 0.1% to 15% by weight of platinum and/or palladium and also contains 2% to 40% by weight of at least one of tungsten, chromium, a Group VIIB metal, and an actinium series metal supported on an acidic refractory oxide carrier. The catalyst in the lower bed contains 1% to 15% by weight of a non-noble Group VIII metal and 1% to 25% by weight of a Group VIB metal on an amorphous, refractory oxide carrier. The liquid hydrocarbon product recovered has a reduced content of aromatics and a reduced heteroatom content.

**5869008****Apparatus and method for the separation and stripping of fluid catalyst cracking particles from gaseous hydrocarbons**

Dewitz Thomas Shaun; Houston, TX, United States assigned to Shell Oil

There is provided an apparatus which separates and strips catalyst particles suspended in gaseous hydrocarbons after the suspension of gaseous hydrocarbons and catalyst particles have traversed a gas/solids conduit means. A substantially can-shaped open-ended cyclone is placed in a disengager shell such that an inlet of the open-ended cyclone is in communication with the gas/solids conduit means. The disengager shell has a zone for containing a fluidized catalyst and the open end of the open-ended cyclone projects into the zone. A hollow, closed cyclone may be placed in communication with the open-ended cyclone via an exhaust conduit means.

**5871635****Hydroprocessing of petroleum fractions with a dual catalyst system**

Gupta Ramesh; Ellis Edward S; Lewis William Ernest; Berkeley Heights, NJ, United States assigned to Exxon Research and Engineering

Hydrocarbonaceous feedstocks admixed with a flow-through catalyst and hydrogen are hydroprocessed in a hydroprocessing reactor containing a captive hydroprocessing catalyst. The flow-through catalyst is continually withdrawn with the hydroprocessed feed from the hydroprocessing reactor. The flow-through catalyst may be an FCC, hydrocracking, isomerization or ring-opening catalyst. In a preferred embodiment, the captive hydroprocessing catalyst contains Co, Ni and/or Mo on an alumina base and the flow-through catalyst is an FCC zeolitic catalyst which is withdrawn with the hydroprocessed feed from the hydroprocessing reactor and then sent to an FCC unit.

**5872073****Reduced ternary molybdenum and tungsten sulfides and hydroprocessing catalysis therewith**

Hilsenbeck Shane J; McCarley Robert E; Schrader Glenn L; Xie Xiaobing; Ames, IA, United States assigned to The United States of America as represented by the United States Department of Energy

New amorphous molybdenum/tungsten sulfides with the general formula  $M_{n+2x}/n(L_6S_8)S_x$ , where  $L$  is molybdenum or tungsten and  $M$  is a ternary metal, have been developed. Characterization of these amorphous materials by chemical and spectroscopic methods (IR, Raman, PES) shows that the  $(M_6S_8)_0$  cluster units are present. Vacuum thermolysis of the amorphous  $Na_{2x}(Mo_6S_8)S_x \cdot yMeOH$  first produces poorly crystalline  $NaMo_6S_8$  by disproportionation at 800°C and well-crystallized  $NaMo_6S_8$  at  $\geq 900^\circ C$ . Ion-exchange of the sodium material in methanol with soluble  $M^{2+}$  and  $M^{3+}$  salts ( $M = Sn, Co, Ni, Pb, La, Ho$ ) produces the  $M_{n+2x}/n(Mo_6S_8)S_x \cdot yMeOH$  compounds. Additionally, the new reduced ternary molybdenum sulfides with the general formula  $M_{n+2x}/nMo_6S_{8+x}-(MeOH)_y(MMoS)$  ( $M = Sn, Co, Ni$ ) are effective hydrodesulfurization (HDS) catalysts both as-prepared and after a variety of pretreatment conditions. Under speci-

fied pretreatment conditions with flowing hydrogen gas, the SnMoS-type catalyst can be stabilized, and while still amorphous, can be considered as Chevrel phase-like in that both contain  $Mo_6S_8$  cluster units. Furthermore, the small cation NiMoS and CoMoS-type pretreated catalyst showed to be very active HDS catalysts with rates that exceeded the model unpromoted and cobalt-promoted  $MoS_2$  catalysts.

**5872075****Catalyst for oxidation of hydrogen, method for selective oxidation of hydrogen, and method for dehydrogenation of hydrocarbon**

Iwakura Tomoatsu; Takiguchi Makoto; Ami, Japan assigned to Mitsubishi Chemical

A catalyst for oxidation of hydrogen, which is characterized in that: (a) it is a catalyst having platinum supported on alumina; (b) said alumina has a BET specific surface area from 0.5 to 6 m<sup>2</sup>/g; and (c) said alumina has an ammonia adsorption of at most 5 μmol/g, is used at the time of producing an unsaturated hydrocarbon by dehydrogenation of a hydrocarbon, whereby hydrogen present in the gas mixture can selectively be oxidized, and thus, the yield can be improved particularly when styrene is produced by dehydrogenation of ethylbenzene.

**5877369****Hydrocarbon conversion catalyst composition and processes therefore and therewith**

Wu An-Hsiang; Drake Charles; Bartlesville, OK, United States assigned to Phillips Petroleum

A catalyst composition and a process for using of the catalyst composition in a hydrocarbon conversion process are disclosed. The composition comprises an inorganic support, a Group VA metal or metal oxide, and optionally a Group IVA metal or metal oxide and a Group VIII metal or metal oxide. The process comprises contacting a fluid which comprises at least one saturated hydrocarbon with the catalyst composition under a condition sufficient to effect the conversion of the hydrocarbon to an olefin. Also disclosed is a process for producing the catalyst composition.

**5877379****Olefin conversion process involving coke suppressor impregnated catalyst**

Wu An-Hsian; Drake Charles; Bartlesville, OK, United States assigned to Phillips Petroleum

A composition and an olefin conversion process are disclosed. The composition comprises a zeolite having incorporated therein a coke-suppressing amount of a coke suppressor selected from the group consisting of silicon oxides, phosphorus oxides, boron oxides, magnesium oxides, tin oxides, titanium oxides, zirconium oxides, molybdenum oxides, germanium oxides, indium oxides, lanthanum oxides, cesium oxides, and combinations of any two or more thereof. The olefin conversion process comprises contacting a first olefin with a catalyst composition under a condition effective to convert said first olefin to a second olefin, wherein the catalyst composition is the same as the composition disclosed above. Also disclosed is a process for producing the composition.

**5877381****Particulate catalyst for use in a fluidized bed**

Sasaki Yutak; Yamamoto Hiroshi; Moriya Kiyoshi; Nakamura Yoshimi; Yokohama, Japan assigned to Nitto Kagaku Kogyo

The present invention provides a fluidized bed catalyst for the synthetic reaction of organic compounds which has a reduced catalyst loss. A fluidized bed catalyst for organic compound synthetic reaction, characterized in that 90% or more of the catalyst particles is in the range of 5–500  $\mu\text{m}$  on the weight-based particle size distribution and 90% or more of the 20–75  $\mu\text{m}$  particles has a crushing strength which satisfies the following equation: (see Patent for Tabular Presentation)  $PS$ , wherein  $CS$  represents a crushing strength (g-weight/particle),  $A$  represents a constant 0.001,  $d$  represents a particle diameter ( $\mu\text{m}$ ), and  $\alpha$  represents a constant 2.

**5877387****Preparation of Pb-substituted hydroxyapatite catalyst and use in oxidative coupling of methane**

Park Tae-Jin; Suh Dong Jin; Lee Kwan-Young; Seoul, Republic of Korea assigned to Korea Institute of Science and Technology

A preparation of a Pb-substituted hydroxyapatite catalyst for oxidative coupling of methane represented by the formula  $\text{Ca}_{10-x}\text{Pb}_x(\text{PO}_4)_6(\text{OH})_2$ , wherein  $0 < x < 10$  or preferably  $0 < x < 3$ , includes dissolving calcium nitrate tetrahydrate ( $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ ), lead nitrate ( $\text{Pb}(\text{NO}_3)_2$ ) and monobasic ammonium phosphate ( $\text{NH}_4\text{H}_2\text{PO}_4$ ) in a distilled water at room temperature to have over 0.01 M concentration and pH 9 and maintaining a resultant precipitate for 5 to 20 h for aging and then calcining the resultant. A method for producing C2 compounds using the thusly produced catalyst includes reacting a mixed gas composed of methane, oxygen and helium in the presence of 5–20 g min/l of the Pb-substituted hydroxyapatite catalyst according to the present invention, at a high temperature of at least 600°C.

**Polymerization catalysis****36103****Process for the preparation of a syndiotactic polyolefin and catalyst therefore**

Winter Andreas; Rohrmann Juergen; Antberg Martin; Dolle Volker; Spaleck Walter; Frankfurt am Main, Germany assigned to Targor

A syndiotactic polyolefin is obtained in a high yield by polymerization or copolymerization of an olefin of the formula  $\text{Ra}-\text{CH}=\text{CH}-\text{Rb}$  in the presence of a catalyst consisting of a metallocene of the formula I (see Patent for Chemical Structure) (I) and an aluminoxane. This polyolefin has a very high syndiotactic index. At a low polymerization temperature, a polyolefin having a low average molecular weight and narrow molecular weight distribution is obtained, and at a high polymerization temperature, a polymer having a high average molecular weight and a wide molecular weight distribution is obtained. Shaped articles produced from the polymers are distinguished by a high transparency, flexibility, tear strength and excellent surface gloss.

**5866497****Catalyst for the production of olefin polymers**

Murray Rex Eugene; Cross Lanes, WV, United States assigned to Univation Technologies LLC

A catalyst precursor of the formula: (see Patent for Chemical Structure) wherein  $R_1$  is a cycloalkadienyl ligand;  $R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$  are independently hydrogen, a hydrocarbyl group containing 1 to 20 carbon atoms, or a silyl group, and may be connected to  $R_1$  through a bridging group comprising at least two Group IVA atoms; with the proviso that one of  $R_3$ ,  $R_4$ , and  $R_5$  is a negative charge stabilizing group selected from the group consisting of Group IVA trialkyl groups, aryl groups, heteroaromatic groups, ethylenically unsaturated hydrocarbon groups, acetylenically unsaturated hydrocarbon groups, ketonic groups, and aromatic organometallic moieties, is provided. When combined with a compound comprising a metal from Groups IIIB to VIII or the Lanthanide series of the Periodic Table of elements and an activating cocatalyst, the catalyst precursor is useful for the polymerization of olefins.

#### 5869417

##### Process for preparing metallocene catalyst for polyolefin polymerization

Woo Seong-Ih; Ko Young-Soo; Seoul, Republic of Korea assigned to Korea Advanced Institute of Science and Technology

The present invention provides a process for preparing a highly active metallocene catalyst by which polyolefin having improved properties can be prepared with a small amount of cocatalyst. A process for preparing a metallocene catalyst of the invention comprises the steps of: modifying the surface of a zeolite or molecular sieve inorganic carrier possessing crystalline pores of 7 to 100 Å size by the addition of an organic solvent and organic aluminum compound under an environment of inert gas and reacting at a constant temperature, and drying; and, impregnating a metallocene compound into the inorganic carrier by the addition of an organic solvent and said metallocene compound, whose diameter is smaller than the diameters of said pores of the inorganic carrier, to the inorganic carrier and reacting at a constant temperature, and drying. In accordance with the present invention, a highly active metallocene catalyst can be prepared in an economical and efficient manner.

#### 5869418

##### Stereospecific catalyst system for polymerization of olefins

Iiskola Eero; Pitkanen Paivi L; Leinonen Tim; Tulisalo Jukka; Harkonen Mika; Bjaland Ann Britt; Soderberg

Tarja; Jaaskelainen Pirjo; Porvoo, Finland assigned to Borealis Holding

Olefins or mixtures of olefins, particularly propene or mixtures of propene advantageously with ethene, can be polymerized using a Ziegler–Natta catalyst system containing, besides a transition-metal-based procatalyst and cocatalyst which is an organometallic compound, a compound particularly suited for controlling the stereospecificity of the produced polymer. Such a compound called an external donor may also have other effects. By using an acetal derivative of an aldehyde that has two ether groups for this purpose, advantageously selected from the group of dialkoxyphenylalkanes, e.g., dimethoxyphenylpropane, a good stereospecificity of the product is attained combined with the high hydrogen sensitivity of the catalyst system, whereby the use of hydrogen as the chain transfer agent offers an easy control method of the molecular weight of the product by means of adjusting the amount of hydrogen available in the polymerization reaction. The acetal derivative is a compound according to formula (III): (see Patent for Chemical Structure) (III), wherein  $R$  is C1–4 alkyl group,  $R_1$  and  $R_2$  are the same or different and each is a hydrocarbon group or a group which can together form a ring,  $R_3$  is hydrogen or a hydrocarbon group. If with the acetal derivative donor is used a clearly less hydrogen sensitive donor, e.g., alkoxysilanes, much broader MWDs of the product are achieved.

#### 5869585

##### Multi-component catalyst systems for olefin polymerization

Mink Robert I; Kissin Yury V; Warren, NJ, United States assigned to Mobil Oil

Multi-component catalyst systems for polymerization and copolymerization of olefins consist of at least one transition metal complex containing a multidentate ligand and a three-component cocatalyst. The transition metal complexes with bidentate ligands  $L$  have empirical formulas (see Patent for Tabular Presentation) PS, where  $M$  is Ti, V, Zr or Hf atom;  $X$  is an alkoxy group, an aryloxy group, or a halogen atom;  $Y$  is a mono- or double-bonded ligand different from  $X$ . Complexes with tridentate ligands  $L'$  have empirical formulas  $L'MX$ , where  $M$  is Ti, V, Zr or Hf;  $X$  is an alkoxy group, an aryloxy group, or a halogen atom. Examples

of  $L$  and  $L'$  are alkyldioxy, alkyldiamino, alkyldicarboxy, biaryldioxy, or alkylaminodioxy ligands; particular examples of  $X$  are the isopropoxy group or Cl; a particular example of  $Y$  is an oxygen atom. The preferred substitution types in the multidentate ligands  $L$  and  $L'$  are such which afford their unimpeded coordination to the metal atom  $M$  in tri-, tetra- or pentacoordinated complexes. The transition metal complexes can be used in pure state or supported on an inert carrier.

#### 5869721

#### **Bidentate coordinated trivalent Group IVB metal complex catalyst for preparing syndiotactic vinyl aromatic polymer**

Chen Yi-Chun; Tsai Jing C; Chao W; Taichung, China (Taiwan) assigned to Industrial Technology Research Institute

A novel trivalent Group IVB metal complex for preparing syndiotactic vinyl aromatic polymers is disclosed which is coordinated by a bidentate ligand and is represented by the formula (I): (see Patent for Tabular Presentation) PS, wherein  $C_5R_nH_{5-n}$  is a substituted or unsubstituted cyclopentadienyl group,  $n$  is an integer between 0 and 5, and  $R$  is C1 to C12 alkyl, aryl, substituted alkyl, or substituted aryl;  $M$  is a trivalent Group IVB metal; (BD) is a bidentate ligand with  $-1$  valence, having a coordinating group which is capable of forming a coordinating bond or a chelating bond with the metal  $M$ ;  $Y$  is selected from the group consisting of alkyl, aryl, aralkyl, halogen and hydrogen;  $m$  is an integer of 1 or 2; and  $m + p = 2$ .

#### 5869723

#### **Ionic compound and olefin polymerization catalyst containing the same**

Hinokuma Shinji; Miyake Shigenobu; Ono Michio; Inazawa Shintaro; Oita, Japan assigned to Showa Denko

PCT No. PCT/JP96/01514. Sec. 371, Date: Feb. 10, 1997. Sec. 102(e), Date: Feb. 10, 1997. PCT Filed Jun. 5, 1996. PCT Pub. No. WO96/41808. PCT Pub. Date: Dec. 27, 1996. Ionic compounds represented by general formula (I), method of their production, olefin polymerization catalyst components, and olefin polymerization catalysts containing the components are provided. (see Patent for Tabular Presentation) PS (wherein,

$M$  is an element belonging to the Group 13;  $R1$ ,  $R2$  and  $R3$  are pentafluorophenyl, etc.,  $R4$  is a substituted phenylene group, etc.,  $k$ ,  $l$  and  $m$  being each 0 or an integer of 1 to 3, and  $n$  being an integer of 1 to 4 such that  $k + l + m + n = 4$ ;  $L$  is trichlorosilyl, methylchlorosilyl, dimethylchlorosilyl group, etc.; and  $D$  is a monovalent cation). The catalyst of this invention, which is used in combination with the ionic compound of this invention, a carrier, an organometal compound and a Group 4, 5 or 6 transition metal compound, has high activity so that polymerization of olefins by a slurry process, a gas phase process or the like using the catalyst gives rise to a polymer having good powder characteristics and attachment of the polymer to the reactor is minimized.

#### 5877109

#### **Catalyst for the gas-phase polymerisation of conjugated dienes**

Reichert Karl-Heinz; Marquardt Peter; Eberstein Christopher; Garmatter Birgit; Sylvester Gerd; Berlin, Germany assigned to Bayer

PCT No. PCT/EP96/01275. Sec. 371, Date: Nov. 10, 1997. Sec. 102(e), Date: Nov. 10, 1997. PCT Filed Mar. 22, 1996. PCT Pub. No. WO96/31543. PCT Pub. Date: Oct. 10, 1996. Catalysts comprising (a) a rare earth alkoxide, a rare earth carboxylate and/or a rare earth coordination compound with diketones, (b) an alumoxane and (c) an inert, particulate, inorganic solid with a specific surface area of greater than  $10 \text{ m}^2/\text{g}$  and a pore volume of 0.3 to  $15 \text{ ml/g}$  are excellently suited to the polymerisation of conjugated dienes, in particular butadiene, in the gas phase.

#### 5877265

#### **Solid titanium catalyst component for olefin polymerization, process for preparing the same, catalyst for olefin polymerization and process for olefin polymerization**

Toida Tetsuya; Shinozaki Tetsunori; Kioka Mamoru; Yamaguchi, Japan assigned to Mitsui Chemicals

A solid titanium catalyst component comprising (a) magnesium, (b) titanium, (c) a halogen, (d) a polyether, (e) a hydrocarbon and (f) an electron donor other than the polyether (d) as essential components, is provided.

Also, a process for preparing a solid titanium catalyst component for olefin polymerization, comprising the steps of contacting a halogenated magnesium compound with a compound selected from the group consisting of an alcohol, an ether and an ester in a hydrocarbon solvent to obtain a magnesium compound solution, contacting the magnesium compound solution with a polyether and contacting the resultant solution with a liquid titanium compound, is provided. Further, a catalyst for olefin polymerization comprising the above-mentioned solid titanium catalyst component, an organoaluminum compound catalyst component and an electron donor, and a process for polymerizing an olefin using the catalyst for olefin polymerization are also disclosed. By the use of the catalyst for olefin polymerization, an olefin (co)polymer having uniform particle size, less dust quantity, high bulk density and high stereoregularity can be obtained with excellent polymerization activity.

**5877268**

**Polyethers and polysiloxane copolymers manufactured with double metal cyanide catalysts**

Jorgenson Michael W; Budnik Richard; Miller Glenn A; Quincy, IL, United States assigned to OSi Specialties

The invention discloses a new class of silicone surfactants and their use for the preparation of flexible urethane foam. The surfactants incorporate high-molecular weight polyethers prepared with narrower molecular weight distributions than conventional polyethers. These polyethers are prepared using a double metal cyanide (DMC) catalyst. These surfactants are better foam stabilizers than the analogous surfactants prepared from conventional polyethers.

**5877371**

**Heterogeneous Lewis acid-type catalysts**

Chen Frank Jung-Yei; Cheradame Herve; Stanat Jon Edmond; Rissoan Gerard; Edison, NJ, United States assigned to Exxon Chemical Patents

A solid state insoluble salt catalyst system for the carbocationic polymerization of olefin monomer in the presence of a polar or non-polar reaction medium, which comprises (a) solid state catalyst component

comprising at least one salt of a strong acid and a carbocationically active transition metal selected from Groups IIIA, IVA, VA and VIA of the Periodic Table of Elements, wherein said salt is insoluble in the reaction medium; and (b) cocatalyst component effective for promoting the carbocationic polymerization.

**Fine chemicals**

**5869738**

**Catalytic systems and methods for carbonylation**

Pan Li Rui; Ina Tomohide; Matsuoka Kazuyuki; Himeji, Japan assigned to Daicel Chemical Industries

A carbonylation catalytic system comprises (a) a combination of (1) a Group VIII metal source of Periodic Table of the Elements (e.g., palladium, palladium chloride) supported on a carrier, (2) a ligand such as triphenylphosphine and (3) an acid such as an alkylsulfonic acid, or (b) a combination of (1) the Group VIII metal source except for palladium (e.g., a platinum compound), (2) a ligand such as triphenylphosphine and (3) an electron donative compound having an electron donability  $\Delta \nu D$  of not less than 2 (for instance, an amine such as a heterocyclic tertiary amine). The catalytic system (b) may further comprise (4) an acid such as methanesulfonic acid. In the presence of the catalytic system a or b, an acetylenic or olefinic unsaturated compound is allowed to react with carbon monoxide and a nucleophilic compound having an active hydrogen such as water, an alcohol and a carboxylic acid in a liquid phase to give an unsaturated or saturated carboxylic acid or an ester thereof with high transformation rate and selectivity.

**5872273**

**Chiral diphosphine compound intermediate for preparing the same transition metal complex having the same diphosphine compound as ligand and asymmetric hydrogenation catalyst**

Saito Takao; Yokozawa Tohru; Zhang Xiaoyaong; Sayo Noburo; Hiratsuka, Japan assigned to Takasago International

A novel diphosphine compound of the formula (I): (see Patent for Chemical Structure), where  $R_1$  and  $R_2$

represent independently cycloalkyl, unsubstituted or substituted phenyl, or a five-membered heteroaromatic ring. The compound is useful as a ligand for an asymmetric reaction, in particular, as an asymmetric hydrogenation catalyst.

**5874600****Ruthenium catalysts and their use in the asymmetric hydrogenation of cyclopentenones**

Rautenstrauch Valentin; Vanhessche Koenraad PM; Genet Jean-Pierre; Lenoir Jean-Yves; Bernex, Switzerland assigned to Firmenich

PCT No. PCT/IB96/01263. Sec. 371, Date: Jul. 10, 1997. Sec. 102(e), Date: Jul. 10, 1997. PCT Filed Nov. 20, 1996. PCT Pub. No. WO97/18894. PCT Pub. Date: May 29, 1997. A catalyst of ruthenium (II) which includes bidentate phosphine ligands. The catalyst is obtainable by a process which includes the steps of treating equimolar amounts of an appropriate Ru(II) complex and a bidentate diphosphine ligand with an acid of formula  $HX$ , wherein  $X$  is a non-coordinating anion. The acid is used in a ratio which does not exceed 2 molar equivalents per mole of Ru(II) complex and the treatment is carried out in a non-coordinating or weakly coordinating solvent and under an inert atmosphere. This catalyst is useful for the preparation of the preferred isomer of HEDIONE, having the (+)-(1*R*)-*cis*-configuration.

**5874622****Hydrogenation of an aromatic compound in the presence of a supported catalyst**

Breitscheidel Boris; Ruhl Thomas; Flick Klemens; Henkelmann Jochem; Henne Andreas; Lebkucher Rolf; Limburgerhof, Germany assigned to BASF

In a process for hydrogenating an aromatic compound in which at least one hydroxyl group is bonded to an aromatic ring or an aromatic compound in which at least one amino group is bonded to an aromatic ring, in the presence of a catalyst comprising as catalytically active component at least one metal of transition group I, VII or VIII of the Periodic Table applied to a support, the catalyst is obtainable by (a) dissolving the catalytically active component or a precursor compound thereof in a solvent, (b) admixing the solution thus obtained

with an organic polymer which is able to bind at least 10 times its own weight of water, giving a swollen polymer, (c) subsequently mixing the swollen polymer with a catalyst support material and (d) shaping, drying and calcining the composition obtained in this way.

**5874639****Metal–ligand complex catalyzed processes**

Nicholson James Clair; Bryant David Robert; Nelson James Russell; Briggs John Robert; Packett Diane Lee; Maher John Michael; St. Albans, WV, United States assigned to Union Carbide Chemicals and Plastics Technology

This invention relates to a process which comprises reacting one or more reactants in the presence of a metal–organopolyphosphorus ligand complex catalyst and optionally free organopolyphosphorus ligand to produce a reaction product fluid comprising one or more products, wherein said process is conducted at a carbon monoxide partial pressure such that reaction rate increases as carbon monoxide partial pressure decreases and reaction rate decreases as carbon monoxide partial pressure increases and which is sufficient to prevent and/or lessen deactivation of the metal–organopolyphosphorus ligand complex catalyst.

**5874640****Metal–ligand complex catalyzed processes**

Bryant David Robert; Leung Tak Wai; Billig Ernst; Eisenschmid Thomas Car; Nicholson James Clair; Briggs John Robert; Packett Diane Lee; Maher John Michael; South Charleston, WV, United States assigned to Union Carbide Chemicals and Plastics Technology

This invention relates to a process for separating one or more phosphorus acidic compounds from a reaction product fluid containing said one or more phosphorus acidic compounds, a metal–organophosphorus ligand complex catalyst and optionally free organophosphorus ligand which process comprises treating said reaction product fluid with an aqueous buffer solution sufficient to neutralize and remove at least some amount of said one or more phosphorus acidic compounds from said reaction product fluid.



**5874647****Benzene hydroxylation catalyst stability by acid treatment**

McGhee William D; Notte Patrick PB; St. Louis, MO, United States assigned to Solutia

A zeolite catalyst for hydroxylating benzene to phenol is treated hydrothermally with a gas comprising approximately 1–100 mol.% water at a temperature between approximately 350°C and 950°C, and subsequently, is treated with an acid. This treatment selectively removes aluminum species from the zeolite catalyst in a manner that increases catalyst stability in phenol production without reducing the activity of the catalyst.

**5877329****Palladium-catalyzed indolization**

Chen Cheng-Y; Larsen Robert D; Colonia, NJ, United States assigned to Merck and Company

Indoles of structural formula (III): (see Patent for Chemical Structure) III are synthesized by the palladium-catalyzed coupling/ring closure of a 2-halo or 2-trifluoromethylsulfonyloxy aniline and an alkyl ketone derivative. The process is particularly useful to form indoles containing acid-labile substituents such as triazole, acetyl, ketal, cyano, and carbamate, or indoles having a facile leaving group in the benzyl position. The advantages of the present process are that it does not require the use of triphenyl phosphine or tetrabutyl ammonium chloride or lithium chloride.

**5877330****Vanadium-containing catalysts, process for manufacturing and use of the same**

Kishimoto Nobuji; Matsunami Etsushige; Himeji, Japan assigned to Nippon Shokubai

PCT No. PCT/JP96/01547. Sec. 371, Date: Jan. 29, 1997. Sec. 102(e), Date: Jan. 29, 1997. PCT Filed Jun. 7, 1996. PCT Pub. No. WO96/41678. PCT Pub. Date: Dec. 27, 1996. Vanadium-containing catalysts are obtained by using polyvanadic acid as a source of vanadium. Vanadium-containing catalysts are obtained by mixing catalyst components other than vanadium, or

their precursors, with a polyvanadic acid sol which is formed by ion-exchanging a metavanadic acid aqueous solution with a proton-type cation-exchange resin and performing polycondensation, and by drying and/or calcining the mixture. Such vanadium-containing catalysts can fully exhibit their catalytic activity under mild reaction conditions, and can be suitably used for various reactions, such as synthesis of phthalic anhydride by the partial oxidation of *o*-xylene, synthesis of benzaldehyde by the partial oxidation of toluene, synthesis of benzoic acid by the partial oxidation of toluene, synthesis of anisaldehyde by the partial oxidation of *p*-methoxy toluene, synthesis of propylene by the oxidative dehydrogenation of propane, synthesis of isobutene by the oxidative dehydrogenation of isobutane, synthesis of methyl formate by the oxidative dehydrogenation of methanol, and synthesis of acrylonitrile by the ammoxidation of propane.

**5877331****Prevention of catalyst attrition and tar formation in manufacture of maleic anhydride**

Mummey Michael J; Keppel Robert A; Reeves A Lamar; Austin, TX, United States assigned to Huntsman Petrochemical

Improved methods and apparatus for manufacture of maleic anhydride by catalytic oxidation of *n*-butane or other hydrocarbon having four carbon atoms in a straight chain over a fixed catalyst bed comprising a phosphorus vanadium oxide catalyst. Movement of catalyst bodies with respect to each other and with respect to the walls of the reaction chamber is restrained so as to prevent the catalyst bodies from abrading against each other or the reactor chamber walls in a manner that would cause formation of catalyst fines. Methods and apparatus are also provided for removal of fines from a fixed catalyst bed. The methods of the invention are effective to prevent loss of catalyst from a tubular reactor, and to control degradation of solvent absorbent in a process in which maleic anhydride is separated from the reaction gas by absorption into such a solvent.

**5877347****Iridium-catalyzed carbonylation process for the production of acetic acid**

Ditzel Evert Jan; Sunley John Glenn; Watt Robert John; Howden, United Kingdom assigned to BP Chemicals

A process for the production of acetic acid comprises (1) continuously feeding methanol and/or a reactive derivative thereof and carbon monoxide to a carbonylation reactor containing a liquid reaction composition comprising an iridium carbonylation catalyst, methyl iodide co-catalyst, a finite concentration of water, acetic acid, methyl acetate and, optionally at least one promoter, (2) carbonylating the methanol and/or reactive derivative thereof with the carbon monoxide in the liquid reaction composition to produce acetic acid; and (3) recovering acetic acid from the liquid reaction composition, there being continuously maintained (a) in the liquid reaction composition water at a concentration of no greater than 4.5% by weight, and (b) in the reactor a carbon monoxide partial pressure in the range from greater than 0 to 7.5 bar.

**5877348****Iridium-catalyzed carbonylation process for the production of acetic acid**

Ditzel Evert Jan; Sunley John Glenn; Watt Robert John; Howden, United Kingdom assigned to BP Chemicals

A process for the production of acetic acid by carbonylating with carbon monoxide methanol and/or a reactive derivative thereof in a carbonylation reactor containing a liquid reaction composition comprising an iridium carbonylation catalyst, methyl iodide co-catalyst, a finite concentration of water, acetic acid, methyl acetate and at least one promoter, wherein the water concentration is at or below that at which the maximum in the graph of carbonylation rate versus water concentration occurs and there is employed in the liquid reaction composition a co-promoter selected from alkali metal iodides, alkaline earth metal iodides, metal complexes capable of generating  $I^-$ , salts capable of generating  $I^-$ , and mixtures of two or more thereof.

**Environmental catalysis****5866065****Ferritic stainless steel of use in particular for catalyst supports**

Herbelin Jean-Marc; Mantel Marc; Cogne Jean-Yves; Albertville, France assigned to Usinor Sacilor

Ferritic stainless steel which resists oxidation at high temperature, of use in particular for a catalyst support

structure, such as for example structures contained in the exhaust pipes of motor vehicles. This stainless steel comprises by weight: 12% to 25% chromium, 4% to 7% aluminium, less than 0.03% carbon, less than 0.02% nitrogen, less than 0.22% nickel, less than 0.002% sulphur, less than 0.6% silicon, less than 0.4% manganese, the active elements selected from the group comprising cerium, lanthanum, neodymium, praseodymium, yttrium taken alone or in combination, at a content of lower than 0.08%, at least one stabilizing element selected from the group comprising zirconium and niobium, the zirconium and/or niobium contents satisfying the following conditions: for the zirconium, (see Patent for Tabular Presentation) PS for the niobium, (see Patent for Tabular Presentation) PS for the zirconium and the niobium (see Patent for Tabular Presentation) PS

**5866079****Ceramic honeycomb catalytic converter**

Machida Minoru; Yamada Toshio; Hijikata Toshihiko; Ichikawa Yukihito; Nagoya, Japan assigned to NGK Insulators

A ceramic honeycomb catalytic converter having a novel casing structure capable of stably retaining a thin-walled ceramic honeycomb catalyst within a metal casing for a long period. A retainer member in the form of a ceramic fiber mat is disposed between an inner peripheral surface of the casing and an outer peripheral surface of the honeycomb catalyst, in a compressed state to generate a surface pressure for retaining the honeycomb catalyst in place. The ceramic fiber mat is composed of heat resistant and non-intumescent ceramic fibers, and has a compression characteristic which is substantially free from a significant increase or decrease over an operative temperature range of the catalytic converter. The casing may be provided with at least one locking member for locking the ceramic fiber mat in a flow direction of exhaust gas passed through the honeycomb catalyst.

**5869013****Process and catalyst for reducing  $No_x$  in exhaust combustion gases**

Tabata Takeshi; Kokitsu Mikako; Okada Osamu; Bellussi Giuseppe; Sabatino Luigina Maria Flora; Toyonaka, Japan assigned to Osaka Gas

The present invention relates to a process for the catalytic reduction of nitrogen oxides contained in exhaust gases from combustion, which process comprises bringing said exhaust gases into contact with a beta zeolite exchanged with suitable amounts of cobalt salts, in the presence of a light hydrocarbon as the reducing agent. The present invention relates also to a catalyst for such a process, which catalyst comprises a beta zeolite exchanged with cobalt salts, characterized by a Co:zeolite AL molar ratio of  $< 0.5$ .

**5869419****Nitrogen oxide removal catalyst**

Obayashi Yoshiaki; Iida Kozo; Nojima Shigeru; Morii Atsushi; Naito Osamu; Hiroshima ken, Japan assigned to Mitsubishi Heavy Industries

This invention effectively utilizes a solid type honeycomb-shaped  $\text{NO}_x$  removal catalyst which has been used in a catalytic ammonia reduction process and hence reduced in  $\text{NO}_x$  removal power, and thereby provides an inexpensive catalyst having  $\text{NO}_x$  removal power equal to that of a fresh catalyst. The nitrogen oxide removal catalyst of this invention, which is useful in a process wherein ammonia is added to exhaust gas and nitrogen oxides present in the exhaust gas are catalytically reduced, has a two-layer structure composed of a lower layer comprising a spent solid type nitrogen oxide removal catalyst and an upper layer comprising a fresh  $\text{TiO}_2\text{-WO}_3\text{-V}_2\text{O}_5$  ternary or  $\text{TiO}_2\text{-WO}_3$  binary catalyst powder which has been applied to the lower layer so as to give a coating thickness of 100 to 250  $\mu\text{m}$ . Moreover, the catalyst powder constituting the upper layer is a catalyst powder obtained by pulverizing a spent solid type nitrogen oxide removal catalyst.

**5872072****Catalytic compositions and a deodorizing method using the same**

Mouri Motoya; Koyou Hiroyuki; Takeuchi Tatsuro; Suita, Japan assigned to Takeda Chemical Industries

A malodorous component is eliminated using a catalytic composition comprising a phosphate of a tetravalent metal (titanium or other Group IV elements of the Periodic Table of Elements), a hydroxide of a divalent metal (copper, zinc or other transition metal), and a

photocatalyst. The photocatalyst includes sulfide-semiconductors, oxide-semiconductors and other photo-semiconductors, e.g., titanium oxide. The composition may further contain silicon dioxide and/or a silver component. The catalytic composition insures efficient elimination of not only acidic components and basic components, but also neutral components over a long period, irrespective of with or without a light irradiation.

**5874057****Lean  $\text{NO}_x$  catalyst / trap method**

Deeba Michel; Feeley Jennifer; Farrauto Robert; North Brunswick, NJ, United States assigned to Engelhard

A  $\text{NO}_x$  abatement composition comprises a  $\text{NO}_x$  abatement catalyst and a  $\text{NO}_x$  sorbent material which are dispersed in proximity to, but segregated from, each other on a common refractory carrier member (10). The  $\text{NO}_x$  sorbent material comprises a basic oxygenated metal compound and optionally further comprises ceria. The  $\text{NO}_x$  abatement catalyst contains a catalytic metal component including a platinum metal catalytic component. The catalytic metal component is segregated from the  $\text{NO}_x$  sorbent material, which may be one or more of metal oxides, metal carbonates, metal hydroxides and mixed metal oxides. At least the catalytic metal component and the  $\text{NO}_x$  sorbent material must be on, or comprise separate, particles; the particles may either be admixed or may be disposed in separate layers (20a, 20b) on the carrier member (10). A  $\text{NO}_x$  abatement method employs the composition and includes periodically adjusting the gas being treated between lean and stoichiometric/rich operating cycles.

**5876680****Bimetallic tungsten/platinum catalysts for lean-burn emissions**

Chattha Mohinder S; Kudla Robert; Hoost T; Northville, MI, United States assigned to Ford Global Technologies

This invention is a bimetallic catalyst comprising tungsten oxide and platinum in critical amounts on a mostly gamma-alumina support material. It is particularly optimal for use in lean-burn engine exhaust systems, including gasoline and diesel, where it efficiently reduces  $\text{NO}_x$  in the exhaust gas.

**5876681****Spinel-based catalysts for reducing exhaust emissions of NO<sub>x</sub>**

Barthe Philipp; Macaudiere Pierre; Seguelong Thierry; Saint Martin Du Tertre, France assigned to Rhone-Poulenc Chimie

Oxygen-rich exhaust gases, e.g., those emanating from internal combustion engines, e.g., diesel engines, are catalytically treated/converted to reduce emissions of NO<sub>x</sub>, in the presence of a catalytically effective amount of a spinel mass oxide essentially having the formula ZnAl<sub>2</sub>O<sub>4</sub> which was prepared by forming a solution or suspension of the salts of the constituent elements of the mass oxide, drying by atomizing the solution or suspension and calcining the salts of the constituent elements of the mass oxide so as to result in the spinel mass oxide.

**5877391****Method for treating gas containing organohalogen compounds, and catalyst for decomposing the organohalogen compounds**

Kanno Shuichi; Kawagoshi Hiroshi; Kato Akira; Arato Toshiaki; Yamashita Hisao; Azuhata Shigeru; Tamata Shin; Ikeda Shinzovs o Yasuda Takeshi; Hitachi, Japan assigned to Hitachi

A method for treating a gas flow containing organohalogen compounds including the steps of contacting the gas flow with a catalyst at a temperature below 500°C in the presence of an effective amount of steam, wherein the catalyst contains titania, tungsten oxide, and silica, the Ti and W are present in the range of 20–95 mol.% Ti and 5–80 mol.% W based on Ti and W, and the amount of silica is in the range of 0.5%–15% by weight silica to 100% by weight titania. Accordingly, the organohalogen compound can be decomposed effectively to carbon monoxide, carbon dioxide, and hydrogen halide.

**Catalysis regeneration****5866495****Method of regenerating deactivated catalysts**

Fung Shun C; Tauster Samuel J; Koo Jay Y; Bridgewater, NJ, United States assigned to Exxon Research and Engineering

A deactivated reforming catalyst comprising a type L zeolite containing a Group VIII noble metal may be regenerated and have enhanced dispersion by a method involving contacting the catalyst with oxygen and water at elevated temperatures, contacting the catalyst at elevated temperatures with a source of chlorine such as HCl or Cl<sub>2</sub>, and preferably oxygen and water, contacting the catalyst at elevated temperatures with oxygen and optionally water, and contacting the catalyst at elevated temperatures with hydrogen and optionally water to reduce the catalyst. Preferably, the noble metal is platinum.

**5877108****Performance of used molybdenum-based catalysts by the addition of ammonium dimolybdate**

Suresh Dev Dhanaraj; Papparizos Christos; Seely Michael J; Drenski Tama Lee; Friedrich Maria Strada; Hudson, OH, United States assigned to The Standard Oil

A process for regenerating molybdenum-containing ammoxidation catalyst, comprising replacing the molybdenum loss from the catalyst during the ammoxidation reaction, wherein ammonium dimolybdenum is utilized as the source for replacement of the molybdenum loss from the original catalyst.

**5877382****Alkylation catalyst regeneration**

Eastman Alan D; Bartlesville, OK, United States assigned to Phillips Petroleum

Disclosed is a process for removing acid soluble oils, produced as an undesirable by-product of an HF (catalyzed alkylation reaction, from a fluid containing a sulfone compound. The process includes the use of hydrocarbons to remove ASO from the sulfone-containing fluid.

**5866088****Catalyst preparation****Process for preparing anhydrous magnesium halide solution and process for preparing solid titanium catalyst component for olefin polymerization**

Itoh Yoshinao; Takeda Masayuki; Kuga gun, Japan assigned to Mitsui Chemicals

Disclosed is a process for preparing an anhydrous magnesium halide solution, comprising a step of distilling water off from an oxygen-containing organic solvent solution of hydrous magnesium halide containing at least calcium as an impurity, to prepare an oxygen-containing organic solvent solution of anhydrous magnesium halide, wherein a potassium compound is added in said step to precipitate calcium and potassium, followed by removing the calcium and potassium. According to this process, an anhydrous magnesium halide solution scarcely containing calcium can be prepared from hydrous magnesium halide containing calcium as an impurity. Also disclosed is a process for preparing a solid titanium catalyst component for olefin polymerization, comprising contacting the anhydrous magnesium halide solution obtained by the above process with a liquid titanium compound to precipitate a solid titanium catalyst component. According to this process, a solid titanium catalyst component for olefin polymerization, which has high catalytic activity, can be prepared by the use of the anhydrous magnesium halide solution.

**5866498****Composite catalysts for hydrocarbon oxidation**

Chattha Mohinder S; Subramanian Somasundaram; Watkins William LH; Northville, MI, United States assigned to Ford Global Technologies

The present invention broadly relates to a catalyst for promoting the oxidation–reduction reactions of the exhaust gases produced by an internal combustion engine, wherein the catalyst comprises; tungsten oxide, a basic metal oxide, and a noble metal. More narrowly, the present invention relates to a catalyst for promoting oxidation–reduction reactions with the exhaust gases produced by internal combustion engine, wherein the catalyst comprises; a composite oxide comprised of a refractory oxide, tungsten oxide in juxtaposed relation with the refractory oxide, and a basic metal oxide in juxtaposed relation with the tungsten oxide; and arrayed on the composite oxide a noble metal.

**5866499****Process for producing a catalyst**

Hums Erich; Kotter Michael; Weyland Friedrich, Hessdorf, Germany assigned to Siemens

In the production of a catalyst containing a catalytically active Mo–V–O phase, the problem exists of keeping the Mo–V–O phase and/or an Mo–V–Ti–O phase substantially free of other catalytically active impurities in order not to catalyze competing reactions at the same time. For this purpose, the invention provides that vanadium oxide and molybdenum oxide are mixed in a ratio of 0.7% to 1% by weight based on  $V_2O_5$  and  $MoO_3$ , the mixture is heated to a temperature above 500°C, the Mo–V–O phase is cooled, ground and then subjected to a reducing treatment, and dispersed on a heated oxidic support, the dispersed material is then ground, and then applied to a suitable macroscopic support, optionally with further additives, and calcined. Alternatively, the material dispersed on the oxidic support can be kneaded with additives to form an extrudable compound, and the compound can be extruded and then calcined so that the honeycomb bodies produced from the compound have crosspiece widths in a range from 0.1 to 0.6 mm and cell densities of 50 to 1200 cells per square inch.

**5866500****Process for producing exhaust-gas-purifying catalyst**

Taguchi Norio; Suzuki Juji; Chiryuu, Japan assigned to Toyota Jidosha

A process for producing an exhaust-gas-purifying catalyst includes the steps of immersing a porous support into a solution including a noble metal catalyst ingredient, thereby preparing a support with a noble metal catalyst ingredient loaded thereon, and thermally treating the noble-metal-catalyst-ingredient-loaded support at a temperature of 800°C or more in non-oxidizing atmosphere. In the thermally treating step, the noble metal catalyst ingredient is prevented from being oxidized to its oxide, and accordingly, it is inhibited from migrating in vapor phase. Further, in the thermally treating step, pores of the porous support are contracted so that they surround the noble metal catalyst ingredient closely therein. All in all, the noble metal catalyst ingredient is prevented from sintering. Thus, the resulting exhaust-gas-purifying catalyst is of superb heat-resistance, and it can be applied to elevated temperatures of 800°C or more in fuel-lean atmosphere.

**5866501****Dispersed anion-modified iron oxide catalysts for hydroconversion processes**

Pradhan Vivek R; Comolli Alfred G; Lee Lap-Keun; Cranbury, NJ, United States

A dispersed fine-sized anion-modified iron oxide slurry catalyst, having high surface area exceeding about 100 m<sup>2</sup>/g and high catalytic activity, and which is useful for hydrogenation and hydroconversion reactions for carbonaceous feed materials, is disclosed. The catalyst is synthesized by rapid aqueous precipitation from saturated salt solutions such as ferric alum or ferric sulfate, and is promoted with at least one active metal such as cobalt, molybdenum, nickel, tungsten and combinations thereof. The iron-based dispersed catalysts are modified during their preparation with anionic modifiers such as molybdate (MoO<sub>4</sub><sup>2-</sup>), phosphate (PO<sub>4</sub><sup>3-</sup>), sulfate (SO<sub>4</sub><sup>2-</sup>), or tungstate (WO<sub>4</sub><sup>2-</sup>). The resulting catalyst usually has primary particle size smaller than about 50 Å, and may be used in the form of a gel or wet cake which can be easily mixed with a hydrocarbonaceous feed material such as coal, heavy petroleum fractions, mixed waste plastics or mixtures thereof. Alternatively, the catalyst can be dried and/or calcined so as to be in a fine dry particulate form suitable for adding to the feed material. The invention includes methods for making the catalyst and processes for using the catalyst for hydroprocessing of the carbonaceous feed materials.

**5866502****Process for the preparation of antimonate catalysts for (AMM) oxidation of alkanes and alkenes**

Cirjak Larry Michael; Pepera Marc Anthony; Burton Township, OH, United States assigned to The Standard Oil

A method of preparing a V<sub>a</sub>Sb<sub>b</sub>M<sub>m</sub>N<sub>n</sub>O<sub>x</sub> catalyst useful in the ammoxidation of a C2–C5 hydrocarbon to its corresponding alpha, beta unsaturated nitrile comprising heating an aqueous mixture comprising V<sub>2</sub>O<sub>5</sub> and Sb<sub>2</sub>O<sub>3</sub> at a temperature above about 100°C to 250°C, preferably 110°C to 175°C, most preferably 120°C to 160°C, under autogenous pressure with agitation to form a catalyst precursor, drying the catalyst precursor and calcining the catalyst precursor to form the finished catalyst.

**5871638****Dispersed anion-modified phosphorus-promoted iron oxide catalysts**

Pradhan Vivek; Comolli Alfred G; Lee Lap-Keun; Cranbury, NJ, United States assigned to Hydrocarbon Technologies

A dispersed fine-sized anion-modified and phosphorus-promoted iron-oxide slurry catalyst having high surface area exceeding 100 m<sup>2</sup>/g and high catalytic activity, and which is useful for hydrogenation and hydroconversion reactions for carbonaceous feed materials is disclosed. The catalyst is synthesized by rapid aqueous precipitation from saturated salt solutions such as ferric sulfate and ferric alum, and is promoted with phosphorus. The iron-based catalysts are modified during their preparation with anionic sulfate (SO<sub>4</sub><sup>2-</sup>). The resulting catalyst has primary particle size smaller than about 50 Å, and may be used in a preferred wet cake or gel form which can be easily mixed with a carbonaceous feed material such as coal, heavy petroleum fractions, mixed waste plastics, or mixtures thereof. Alternatively, the catalyst can be dried and/or calcined so as to be in a fine dry particulate form suitable for adding to the feed material. The invention includes methods for making the catalyst and processes for using the catalyst for hydroprocessing of carbonaceous feed materials to produce desirable low-boiling hydrocarbon liquid products.

**5874125****Activating catalytic solution for electroless plating and method of electroless plating**

Kanoh Osamu; Senda Atsuo; Ohmihachiman, Japan assigned to Murata Manufacturing

There is provided a method of forming a conductive film having a predetermined pattern in hybrid ICs, high frequency dielectric filters and the like which makes it possible to safely and efficiently perform a series of the steps of preparing an activating catalytic solution for forming a photoreactive film on a base, forming the photoreactive film through the application of the activating catalytic solution, producing an activating catalyst by exposing particular regions of the photoreactive film, developing by flushing away the photoreactive

film in unexposed regions, and immersing the base in an electroless plating bath without using an organic solvent and which allows the formation of a plating film having high electrical conductivity and high strength of adherence. A hydrophilic activating catalytic solution is used which is obtained by dissolving copper oxalate, a palladium salt such as palladium chloride into an alkaline solution such as ammonia. Since the activating catalytic solution itself does not include any organic solvent, the photoreactive film can be flushed away in unexposed regions using water at the developing step, which allows immediate immersion into an electroless plating bath.

**5874380****Heterogeneous Lewis acid-type catalysts**

Chen Frank Joung-Ye; Cheradame Herve; Stanat Jon Edmond; Risoan Gerard; Edison, NJ, United States assigned to Exxon Chemical Patents

A solid state insoluble salt catalyst system for the carbocationic polymerization of olefin monomer in the presence of a polar or non-polar reaction medium, which comprises (a) solid state catalyst component comprising at least one salt of a strong acid and a carbocationically active transition metal selected from Groups IIIA, IVA, VA and VIA of the Periodic Table of Elements, wherein said salt is insoluble in the reaction medium; and (b) cocatalyst component effective for promoting the carbocationic polymerization.

**5874381****Cobalt on alumina catalysts**

Bonne Raimond Laurentius; Lok Cornelis Martinus; Wirral, United Kingdom assigned to Crosfield

PCT No. PCT/EP95/02836. Sec. 371, Date: Apr. 8, 1997. Sec. 102(e), Date: Apr. 8, 1997. PCT Filed Jul. 17, 1995. PCT Pub. No. WO96/04072. PCT Pub. Date: Feb. 15, 1996. A cobalt on transition alumina catalyst, containing between 3% and 40% by weight of cobalt has a cobalt surface area above 30 m<sup>2</sup>/g of cobalt, preferably above 50 m<sup>2</sup>/g of cobalt, most preferably above 80 m<sup>2</sup>/g of cobalt.

**5874596****Titanosilicate catalyst particle**

Onozawa Takashi; Kondo Osamu; Ibaraki, Japan assigned to Mitsubishi Gas Chemical

A titanosilicate catalyst and method for preparing the same, comprising primary titanosilicate particles which are combined with one another, wherein the titanosilicate catalyst comprises pores having a pore diameter from 50 Å to 300 Å. The inventive catalyst exhibits activity in a hydroxylation reaction of an aromatic compound, or an epoxidation reaction of an olefin, or an ammoximation reaction of a ketone using hydrogen peroxide as an oxidant.

**5874628****Method for preparation of tertiary phosphines via nickel-catalyzed cross coupling**

Laneman Scott A; Ager David J; Eisenstadt Amihia; Vernon Hills, IL, United States assigned to Monsanto

The invention is an improved method for the preparation of tertiary phosphines by way of cross-coupling of aryl, alkenyl, cycloalkenyl or aralkyl halides or aryl, alkenyl, cycloalkenyl or aralkyl sulfonate esters with chlorophosphines in the presence of a catalyst and a reductant. The general reaction scheme is shown below: (see Patent for Chemical Structure), wherein *R*1 is aryl, alkenyl, cycloalkenyl or aralkyl, any of which may be substituted by one or more of the following: alkyl, aryl, aralkyl, alkoxy, alkanoyl, chloro, fluoro, alkoxy carbonyl, cyano, trifluoromethyl, cycloalkyl, or CONR<sub>4</sub>R<sub>5</sub>, wherein *R*4 and *R*5 are independently hydrogen, alkyl, aryl or aralkyl; *R*2 and *R*3 are independently aryl, alkyl, aralkyl, any of which may be substituted by one or more of the following: alkyl, aryl, aralkyl, alkoxy, alkanoyl, chloro, fluoro, alkoxy carbonyl, cyano, trifluoromethyl, cycloalkyl or CoNR<sub>4</sub>R<sub>5</sub>, wherein *R*4 and *R*5 are independently hydrogen, alkyl, aryl or aralkyl; and *n* is 2, where *R*1 is a difunctional moiety and 1 for any other *R*1; and *X* is Cl, Br, I, or OSO<sub>2</sub>*Y*; wherein *Y* is alkyl, trihalomethyl, phenyl, halophenyl, or alkylphenyl.

**5876587****Electrochemical synthesis of transition metal/phosphine catalysts**

Horbez Dominique; Huser Marc; Perron Robert; Franconville, France assigned to Rhone-Poulenc Chimie

Catalyst compounds comprising at least one transition metal in an oxidation state of 0 to 1, and at least one monodentate or bidentate water-soluble phosphine, well suited for the hydrocyanation of ethylenically unsaturated compounds, are electrochemically synthesized, by electrolyzing an aqueous solution catholyte (contained in the cathode compartment of any suitable electrolytic cell) comprising at least one transition metal compound and at least one monodentate or bidentate water-soluble phosphine, advantageously at least one

phosphine having the following formulae (I) and/or (II): (see Patent for Tabular Presentation) PS (see Patent for Tabular Presentation) PS.

**5877377****Metal oxide catalyst and use thereof in chemical reactions**

Golunski Stanislaw E; Gascoyne John M; Fulford Anthony; Jenkins John W; Reading, United Kingdom assigned to Johnson Matthey Public

A method for conducting a chemical reaction with a catalyst composed of metal oxide particles among which are uniformly incorporated, in order to reduce the operating temperature of the catalyst, palladium particles.